| | Universitas Negeri Surabaya<br>Faculty of Engineering,<br>Electrical Engineering Masters Study Program | Document Code |
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# SEMESTER LEARNING PLAN

| Courses | CODE | Course Family | Credit Weight | | | SEMESTER | Compilation Date |
|---|---|---|---|---|---|---|---|
| Pattern Recognition | 2010103007 | Compulsory Study Program Subjects | T=3 | P=0 | ECTS=6.72 | 2 | May 14, 2023 |

| AUTHORIZATION | SP Developer | Course Cluster Coordinator | Study Program Coordinator |
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| | Dr. Lilik Anifah, S.T., M.T. | Unit Three Kartini, S.T., M.T., Ph.D. | Unit Three Kartini, S.T., M.T., Ph.D. |

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| **Learning model** | **Case Studies** |
| **Program Learning Outcomes (PLO)** | **PLO study program which is charged to the course** |
| | **Program Objectives (PO)** |
| | **PO - 1** CLO1-CPL-S3 3. Able to show a responsible attitude for solving problems in the field of Electrical Engineering based on data using the pattern recognition method. |
| | **PLO-PO Matrix** |

| P.O |
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| PO-1 |

**PO Matrix at the end of each learning stage (Sub-PO)**

| P.O | Week | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| PO-1 | | | | | | | | | | | | | | | | |

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| **Short Course Description** | Pattern Recognition is the study of recognizing characteristics or data that yield information about a particular system or data set. Next, a classification process is carried out using statistics, Template Matching, or Artificial Intelligence. It is hoped that the results of this analysis and classification will be useful for predictions that are useful for human life. |
| **References** | **Main :** |
| | 1. Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.<br>2. Sergio Theodoridis, Pattern Recognition, Elsevier, 2009. |
| | **Supporters:** |
| | 1. Jurnal Penelitian yang relevan. |
| **Supporting lecturer** | Dr. Lilik Anifah, S.T., M.T. |

| Week- | Final abilities of each learning stage (Sub-PO) | Evaluation | | Help Learning, Learning methods, Student Assignments, [ Estimated time] | | Learning materials [ References ] | Assessment Weight (%) |
|---|---|---|---|---|---|---|---|
| | | Indicator | Criteria & Form | Offline ( *offline* ) | Online ( *online* ) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

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| **1** | Sub CLO1-CLO4-CPL-P4 4. Able to explain pattern recognition methods in the areas of specialization, namely power and intelligence systems, telecommunications and intelligent networks, and information technology | Students are able to explain pattern recognition methods in areas of specialization, namely power and intelligence systems, telecommunications and intelligent networks, and information technology | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Participatory Activities | Lectures, discussions, presentations 3x50 minutes | | **Material:** 1. Introduction<br>**Bibliography:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.* | 6% |
| **2** | Sub CLO2-CLO4-CPL-P4 4. Capable of feature extraction for further use in the pattern recognition process in areas of specialization, namely power and intelligence systems, telecommunications and smart networks, and information technology. | Students are able to carry out the feature extraction process to then be used in the pattern recognition process in the fields of specialization, namely power and intelligence systems, telecommunications and smart networks, and information technology. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Participatory Activities | Lectures, discussions, presentations 3x50 minutes | | **Material:** 2. Feature Extraction<br>**Bibliography:** *Sergio Theodoridis, Pattern Recognition, Elsevier, 2009.* | 6% |
| **3** | Sub CLO3-CLO4-CPL-P4 4. Able to apply statistical-based pattern recognition methods in areas of specialization, namely power and intelligence systems, telecommunications and smart networks, and information technology. | Students are able to apply statistical-based pattern recognition methods in areas of specialization, namely power and intelligence systems, telecommunications and intelligent networks, and information technology. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Participatory Activities | Lectures, discussions, presentations | | **Material:** 3. Statistically Based Pattern Recognition<br>**Reference:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.* | 6% |
| **4** | Sub CLO4-CLO4-CPL-P4 4. Able to apply pattern recognition methods based on Linear Models Regression in areas of specialization, namely power and intelligence systems, telecommunications and smart networks, and information technology. | Students are able to apply pattern recognition methods based on Linear Models Regression in areas of specialization, namely power and intelligence systems, telecommunications and intelligent networks, and information technology. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Participatory Activities | Lectures, discussions, presentations 3x50 minutes | | **Material:** 4. Linear Models for Regression<br>**Reference:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.*<br><br>**Material:** 4. Linear Models for Regression<br>**Library:** *Relevant research journals.* | 6% |
| **5** | Sub CLO5-CLO4-CPL-P4 4. Able to apply Linear Models Classification-based pattern recognition methods in areas of specialization, namely power and intelligence systems, telecommunications and smart networks, and information technology. | Students are able to apply pattern recognition methods based on Linear Models Classification in areas of specialization, namely power and intelligence systems, telecommunications and intelligent networks, and information technology. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations 3x50 minutes | | **Material:** 5. Linear Models for Classification<br>**Reference:** *Sergio Theodoridis, Pattern Recognition, Elsevier, 2009.*<br><br>**Material:** 5. Linear Models for Classification<br>**Library:** *Relevant Research Journals.* | 6% |

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| **6** | | Students are able to apply Minimum Distance Calculation-based pattern recognition methods in areas of specialization, namely power and intelligence systems, telecommunications and smart networks, and information technology. | **Criteria:**<br>Scale assessment score 0-100<br><br>**Form of Assessment** :<br>Project Results Assessment / Product Assessment | Sub CLO6-CLO4-CPL-P4 4. Able to apply Minimum Distance Calculation-based pattern recognition methods in areas of specialization, namely power and intelligence systems, telecommunications and smart networks, and information technology.<br>3x50 minutes | | **Material:** 6. Minimum Distance Calculation<br>**Reference:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.*<br><br>**Material:** 6. Minimum Distance Calculation<br>**Library:** *Relevant research journals.* | 6% |
| **7** | Sub CLO7-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through a data-based inter or multidisciplinary approach using a pattern recognition method based on Template Matching. | Students are able to solve science, technology and/or arts problems in the field of electrical engineering through a data-based inter or multidisciplinary approach using a pattern recognition method based on Template Matching.<br>3x50 minutes | **Criteria:**<br>Scale assessment score 0-100<br><br>**Form of Assessment** :<br>Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations<br>3x50 minutes | | **Material:** 7. Pattern Recognition Using Template Matching<br>**Library:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.*<br><br>**Material:** 7. Pattern Recognition Using Template Matching<br>**Library:** *Relevant Research Journals.* | 6% |
| **8** | Sub CLO8-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through a data-based inter or multidisciplinary approach using the Decision Three pattern recognition method. | Students are able to solve science, technology and/or arts problems in the field of electrical engineering through a data-based inter or multidisciplinary approach using the Decision Three pattern recognition method. | **Criteria:**<br>Scale assessment score 0-100<br><br>**Form of Assessment** :<br>Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations | | **Material:** 8. Pattern Recognition Using Decision Three<br>**Library:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.*<br><br>**Material:** 8. Pattern Recognition Using Decision Three<br>**Literature:** *Relevant Research Journals.* | 6% |

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| **9** | Sub CLO9-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through a data-based inter or multidisciplinary approach using the Supervised and Unsupervised pattern recognition method. | Able to solve science, technology and/or arts problems in the field of electrical engineering through a data-based inter or multidisciplinary approach using Supervised and Unsupervised pattern recognition methods. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Participatory Activities | Lectures, discussions, PjBL, presentations | -<br>- | **Material:** 9. Pattern Recognition Using Supervised and Unsupervised<br>**References:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.*<br><br>**Material:** 9. Pattern Recognition Using Supervised and Unsupervised<br>**Literature:** *Relevant Research Journals.* | 6% |
| **10** | Sub CLO10-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition Using a Self Organizing Map. | Students are able to solve science, technology and/or art problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition using a Self Organizing Map. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Participatory Activities | Lectures, discussions, PjBL, presentations 3x50 minutes | -<br>- | **Material:** 10. Pattern Recognition Using Self Organizing Map<br>**Reference:** *Sergio Theodoridis, Pattern Recognition, Elsevier, 2009.*<br><br>**Material:** 10. Pattern Recognition Using Self Organizing Map<br>**Library:** | 7% |
| **11** | Sub CLO10-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition Using a Self Organizing Map. | Students are able to solve science, technology and/or art problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition using a Self Organizing Map. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations 3x50 minutes | | **Material:** 11. Pattern Recognition Using Self Organizing Map<br>**Library:** *Relevant Research Journals.* | 7% |
| **12** | Sub CLO11-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition Using Linear Vector Quantization. | Students are able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition using Linear Vector Quantization. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations | -<br>- | **Material:** 12. Pattern Recognition Using Linear Vector Quantization<br>**Reference:** *Sergio Theodoridis, Pattern Recognition, Elsevier, 2009.*<br><br>**Material:** 12. Pattern Recognition Using Linear Vector Quantization<br>**Library:** *Relevant Research Journals.* | 7% |

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| **13** | Sub CLO11-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition Using Linear Vector Quantization. | Students are able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition using Linear Vector Quantization. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations | -<br>- | **Material:** 12. Pattern Recognition Using Linear Vector Quantization **Reference:** *Sergio Theodoridis, Pattern Recognition, Elsevier, 2009.*<br><br>**Material:** 12. Pattern Recognition Using Linear Vector Quantization **Library:** *Relevant Research Journals.* | 7% |
| **14** | Sub CLO11-CLO2-CPL-KU2 2. Able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition Using Linear Vector Quantization. | Students are able to solve science, technology and/or arts problems in the field of electrical engineering through an inter or multidisciplinary approach based on Pattern Recognition using Linear Vector Quantization. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations | -<br>- | **Material:** 12. Pattern Recognition Using Linear Vector Quantization **Reference:** *Sergio Theodoridis, Pattern Recognition, Elsevier, 2009.*<br><br>**Material:** 12. Pattern Recognition Using Linear Vector Quantization **Library:** *Relevant Research Journals.* | 7% |
| **15** | Sub CLO13-CLO1-CPL-S3 3. Able to show a responsible attitude for solving problems in the field of Electrical Engineering based on data using pattern recognition methods by evaluating the results of experiments that have been carried out. | Able to show a responsible attitude in solving problems in the field of Electrical Engineering based on data using pattern recognition methods by evaluating the results of experiments that have been carried out. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations 3x50 minutes | | **Material:** 15. Evaluation Method **References:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.*<br><br>**Material:** 15. Evaluation Method **Library:** *Relevant research journals.* | 7% |
| **16** | Sub CLO13-CLO1-CPL-S3 3. Able to show a responsible attitude for solving problems in the field of Electrical Engineering based on data using pattern recognition methods by evaluating the results of experiments that have been carried out. | Able to show a responsible attitude in solving problems in the field of Electrical Engineering based on data using pattern recognition methods by evaluating the results of experiments that have been carried out. | **Criteria:** Scale assessment score 0-100<br><br>**Form of Assessment** : Project Results Assessment / Product Assessment | Lectures, discussions, PjBL, presentations 3x50 minutes | | **Material:** 15. Evaluation Method **References:** *Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.*<br><br>**Material:** 15. Evaluation Method **Library:** *Relevant research journals.* | 4% |

**Evaluation Percentage Recap: Case Study**

| No | Evaluation | Percentage |
|---|---|---|
| 1. | Participatory Activities | 37% |
| 2. | Project Results Assessment / Product Assessment | 63% |

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| | 100% |

**Notes**

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.